Amendments to the Claims

Claims:

1. (Currently amended) An xDSL modem for data transmission between a central office and a customer device over a subscriber line, the xDSL modem comprising a topology determining unit configured to determine the topology of the subscriber line, and further comprising a control unit configured to switch the xDSL modem between a normal mode for data transmission and a topology determining mode for determining the topology of the subscriber line.

2. (Original) The xDSL modem according to claim 1, wherein the topology determining unit comprises:

(a) a signal generator configured to generate at least one signal pulse which is transmitted to subscriber line loop;

(b) an echo detection unit configured to detect an echo signal received from the subscriber line loop; and

(c) an evaluation unit connected to said echo detection unit, said evaluation unit comprising:

(c1) a deconvolution unit configured to deconvolve the detected echo signal to determine a transfer function H_{ML} of a measurement loop between said signal generator and said echo detection unit;

(c2) a calculation unit configured to calculate a transfer function H_{SLL} of the subscriber line loop between the xDSL modem and the customer device on the basis of the determined transfer function H_{ML} of the measurement loop; and

(c3) a model parameter optimization unit configured to optimize a model transfer function H_{SLLM} of the subscriber line loop model such that an error function between the model transfer function H_{SLLM} and the calculated transfer function H_{SLL} of the subscriber line loop is minimized.

3. (Original) The xDSL modem according to claim 2, further comprising a model parameter memory configured to memorize at least one parameter vector comprising model parameters of a subscriber line loop model.

4. (Canceled)

5. (Currently amended) The xDSL modem according to claim [[4,]]1, wherein said control unit is configured to switch, in the topology determining mode, a signal generator of the topology determining unit to the subscriber line loop by a first switch and the echo determining unit to the subscriber line loop by a second switch.

6. (Original) The xDSL modem according to claim 3, wherein the model parameter memory comprises a plurality of parameter vectors corresponding to different subscriber line loop models.

7. (Original) The xDSL modem according to claim 6, wherein a parameter vector is selected by the control unit for optimization by the parameter optimization unit.

8. (Original) The xDSL modem according to claim 2, wherein the optimised model parameters indicate the subscriber line loop topology.

9. (Original) The xDSL modem according to claim 1, wherein the customer device is a telephone.

10. (Original) The xDSL modem according to claim 9, wherein a probing signal is sent to detect whether the telephone is on hook or off hook.

11. (Original) The xDSL modem according to claim 10, wherein the control unit does not switch to the topology determining mode when the telephone is off hook.

12. (Original) The xDSL modem according to claim 2, wherein the evaluation unit comprises a data transmission bit rate calculation circuit configured to calculate in a maximum data transmission bit rate of the subscriber line depending on the detected echo signal and a data symbol rate.

13. (Original) The xDSL modem according to claim 2, wherein said signal generator is configured to generate a sequence comprising a plurality of signal pulses.

14. (Original) The xDSL modem according to claim 13, wherein the amplitude of each pulse is smaller than a dynamic range of an analogue front end of the xDSL modem.

15. (Currently amended) The xDSL modem according to claim [[4,]]1, further comprising an echo cancellation unit configured to be activated in the normal mode, and deactivated in the topology determining mode.

16. (Original) A topology determining unit for determining a topology of a subscriber line loop, the unit comprising:

(a) a deconvolution unit configured to deconvolve an echo signal of at least one signal pulse sent by that topology determining circuit to determine a first transfer function H_{ML} of a measurement loop;

(b) a calculation unit configured to calculate a second transfer function H_{SLL} of the subscriber line loop on the basis of the first transfer function H_{ML}; and

(c) a model parameter optimization unit configured to optimize a model transfer function H_{SLLM} of a subscriber line loop model such that an error function of the difference between the model transfer function H_{SLLM} and the calculated second transfer function H_{SLL} of that subscriber line loop is minimal.

17. (Original) An optimization unit for providing a topology of a subscriber line loop, the optimization unit configured to optimize model parameters of a predetermined transfer function H_{SLLM} of a subscriber line loop model stored in a memory such that an error function of the difference between the model transfer function H_{SLLM} and a calculated function H_{SLL} of the subscriber line loop is minimized, wherein the optimized model parameters output by said optimization unit indicate the topology of said subscriber line loop.

18. (Currently amended) A method for determining a topology of a subscriber line loop, the method comprising:

(a) optimizing the model parameters of a model transfer function H_{SLLM} of a subscriber line loop model stored in a memory such ~~said~~ that an error function of a difference between a model transfer function H_{SLLM} and a calculated transfer function H_{SLL} of the subscriber line loop is minimized; and

(b) outputting the optimized model parameters which indicate the topology of said subscriber line loop.

19. (Currently amended) A method for determining a topology of a subscriber line loop comprising the following steps:

(a) transmitting at least one signal pulse generated by a signal generator to a subscriber line;

(b) detecting the echo signal received from the subscriber line loop via an echo signal detection unit;

(c) deconvolving the detected echo signal to determine a transfer function H_{ML} of a measurement loop between the signal generator and said echo detection unit;

(d) calculating a transfer function H_{SLL} of the subscriber line loop on the basis of determined transfer function H_{ML} of the measurement loop;

(e) optimizing a subscriber line loop model transfer function H_{SLLM} such ~~said~~ that an error function of the difference between the model transfer function H_{SLLM} and a calculated transfer function H_{SLL} of the subscriber line loop is minimized; and

(f) outputting the model parameters of the optimized transfer function $H_{SLLM\ opt}$ of the subscriber line loop model as the topology of the subscriber line loop.